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HIGH MOISTURE BARLEY

PREPARATION AND STORAGE

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HIGH MOISTURE BARLEY

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HIGH MOISTURE BARLEY

Considerable interest has been expressed in the storage of high moisture grains, having a moisture content of 25 - 45 per cent. In certain areas the climate is subject to fall rains, high humidity and short days, with the result that the grain often does not dry down to 15 per cent moisture. Consequently, farmers are forced to dry grains artificially, leave them out over winter, or else attempt to store them in a tough or damp condition. If the grain is to be used for a livestock feed, storage of the grain in a high moisture condition is a practical alternative.

High moisture grain can be successfully stored in a variety of containers. The most successful storage units are concrete-lined pit silos, wood-walled bunker silos, glass-lined tower silos and lined concrete tower silos. While the glass-lined tower silos will store high moisture grain with the least amount of loss, the high cost of these units usually offsets the extra feed saved. Some large Washington feedlot operators have indicated that the value of feed lost in concrete pit silos was less than the interest charges on glass-lined tower silos.

Concrete pit silos that are constructed for storing high moisture grain should be made as narrow as possible to reduce the size of the open face. They should be made wide enough, though, to permit a tractor to pack the grain, and a tractor and loader to remove the grain. The silo will likely be 10 to 12 feet wide. The correct silo depth will depend on how much grain will be removed each day. Montana researchers suggest that at least 2 to 3 inches of the face of the silo be fed each day.

If a bunker silo is constructed out of wood the floor of the silo should be concrete. The sides of the silo can be made of pressure-treated planks. The complete side must be lined with plastic as is shown in the diagram.

SEALING BUNKER SILOS

(Figure 1)

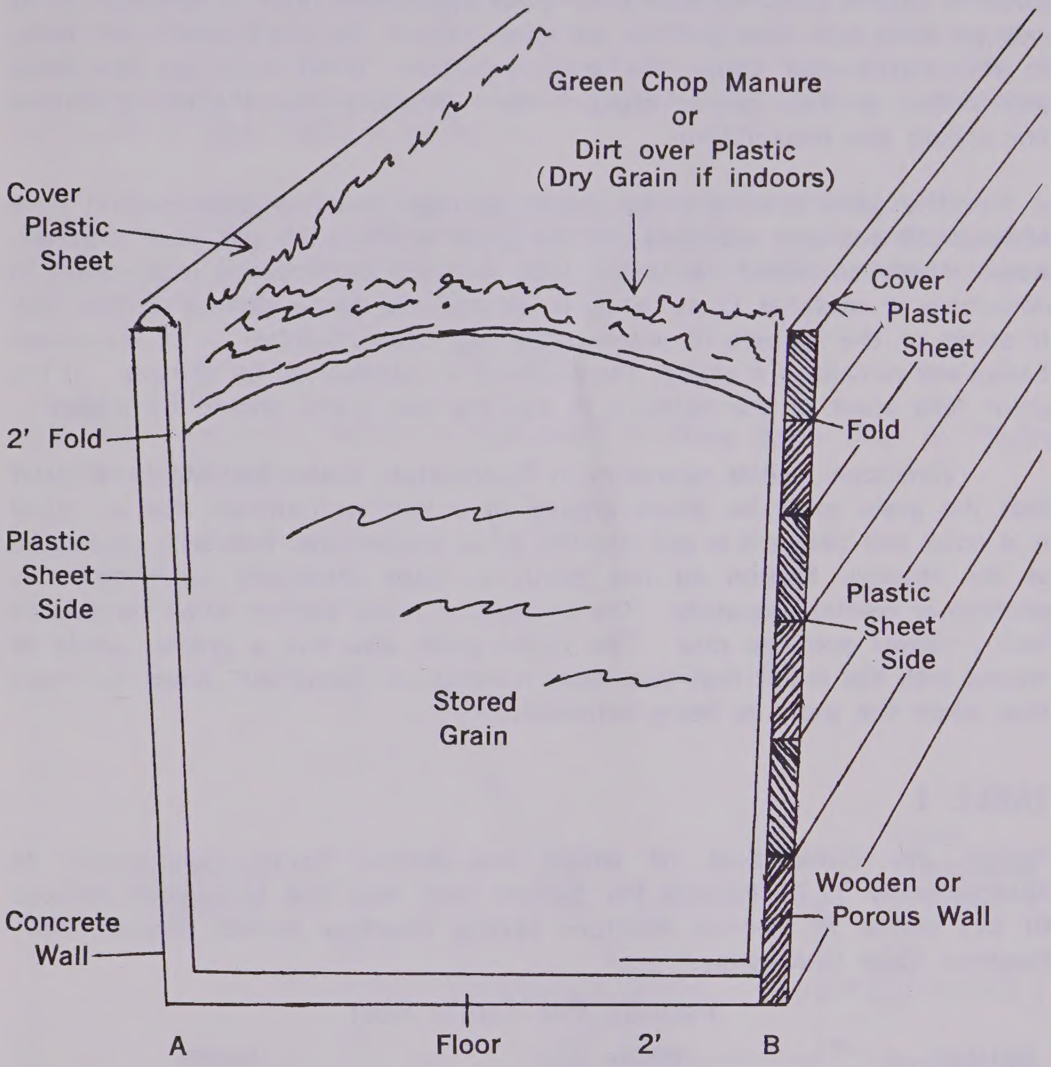


Fig. 2. Method used in sealing high moisture grain in bunker silos. (A) Treated Concrete Wall: Plastic sheeting is placed along side starting two feet from the top of wall then grain is packed against sheet, remainder of sheet folded over grain. Cover sheet is placed over both folds then weighed down with heavy material. (B) Wooden Walls are same as A except sheeting extended to floor and two feet under grain. Sheet must be in place before filling.

Montana State University, Bozeman, Montana.

The plastic that is placed on the top of the high moisture grain should be covered with some material that does not permit air bubbles to form under the plastic. Old silage or manure has been used very successfully. A thin layer of dirt will also work quite satisfactorily. The covering material can be removed with the tractor and loader prior to feeding. Bales can be used but they provide an ideal habitat for mice which eat holes in the plastic and cause the grain to spoil. Used tires are the least satisfactory as they neither apply uniform pressure over the entire surface nor absorb any precipitation.

The grain that is to be stored as high moisture grain should have at least 25 per cent moisture. If the grain is below 25 per cent moisture, water should be added. A simple test, outlined by Montana researchers to determine if material is suitable, is to squeeze some kernels in the fist. If some of the kernels of whole grain will stick together or if the rolled barley will remain in a clump, the material is satisfactory for storage. If the grain falls apart in the palm, it is too dry and water should be added.

American feedlot operators in Washington, Idaho and Montana insist that the grain must be either ground in a burr or hammer mill or rolled in a roller mill before it is put into the pit or bunker silo. Research conducted at the Huntley Station by the Montana State University confirmed this practice of feedlot operators. The crushed or rolled kernels when compacted had a slower spoilage rate. The rolled grain also has a greater angle of repose with the result that less loose material is "sloughed" down the open face when the grain is being removed.

TABLE 1

Pounds Per Cubic Foot Of Whole And Rolled Barley Compressed At Approximately 11.25 Pounds Per Square Inch And The Equivalent Amount Of Dry Matter At Various Moisture Levels, (Huntley Branch Station, A67, Montana State University).*

	Pounds Per Cubic Foot			
Moisture	Whole		Rolled	
Level (%)	High Moisture	Dry Matter	High Moisture	Dry Matter
5 - 10	41.8	38.3	38.0	35.3
10 - 15	42.5	36.8	38.7	33.6
15 - 20	43.4	35.4	39.8	32.5
20 - 25	44.1	33.9	41.2	31.6
25 - 30	44.8	32.2	42.1	30.2
30 - 35	46.8	31.1	46.0	30.6
35 - 40	48.9	30.7	48.5	30.4

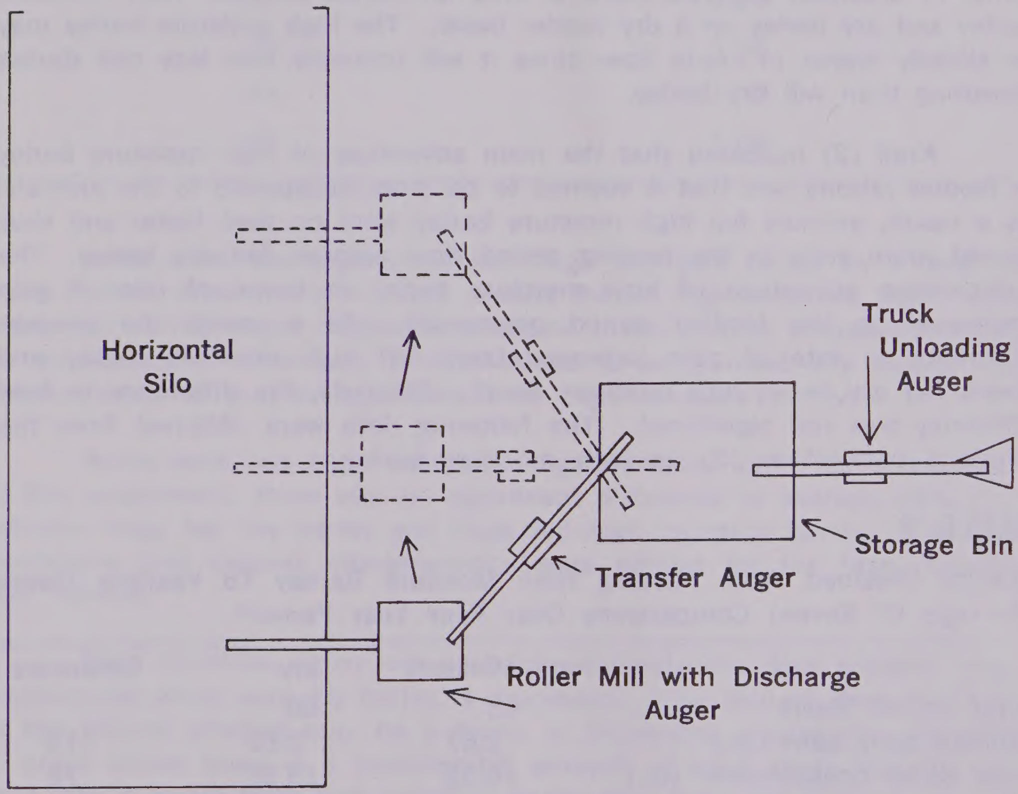
*Krall, 1969

If a roller mill is used, the tension against the rollers should be loosened to a point where the barley is nearly whole, and then tightened until good flaking occurs. Excessive roll tension will result in gumming of the rollers. It may be necessary to install scrapers on the roller mill with approximately 1/16 inch of clearance to remove gummed materials from the rolls. If a burr or hammer mill is used, the dust collector should be removed as dough will build up on the walls of the dust collector. Tests in Minnesota and Montana showed that the roller mill's capacity was lowered when rolling high moisture barley.

As the feed is prepared either by grinding or rolling, it should be well packed in the silo. A heavy wheel tractor with a loader will work best for this job. Enough space should exist in the silo for the tracks to overlap and thus permit packing of the entire silo.

(See Figure 2)

One Man Processing Set-up to Mill High Moisture Grain Prior to Placing in a Horizontal Silo.



A Burr or Hammer Mill may be used instead of the Roller Mill to grind the high moisture grain.

Because the feed has been ground prior to storage it is not necessary to grind the grain before feeding. The easiest way to remove this grain from the silo is with a tractor and loader. If the feed bunks are not too far from the silo the tractor and loader may be used to place the high moisture grain directly into the feed bunk. Larger operators, who are using mixer wagons or mixer trucks, should find it convenient to load directly from the silo into the mixer unit.

Once the face of the silo has been opened it should be left exposed. Recovering the face will result in high spoilage as the humid warm condition combined with a new supply of oxygen is ideal for microbial activity.

A bunker silo 10 feet wide and 50 feet long, filled to a depth of six feet, can be constructed out of pressure treated planks with a concrete floor for about $600. This silo will hold over 3,000 bushels of barley and will feed 60 steers for about 200 days. If the steers are fed at a daily rate of 15 pounds per head, about three inches of the face will be used each day.

High moisture barley may be used effectively as a feed grain. In terms of chemical analysis there is little difference between high moisture barley and dry barley on a dry matter basis. The high moisture barley may be slightly higher in crude fiber since it will probably lose less hull during threshing than will dry barley.

Krall (2) indicated that the main advantage of high moisture barley in feedlot rations was that it seemed to be more acceptable to the animals. As a result, animals fed high moisture barley went on feed faster and thus gained more early in the feeding period than animals fed dry barley. The comparative advantage of high moisture barley in terms of rate of gain decreased as the feeding period progressed. As a result, the average difference in rate of gain between steers fed high moisture barley and steers fed dry barley was relatively small. Similarly, the difference in feed efficiency was not significant. The following data were obtained from the Montana publication (2) on high moisture barley.

TABLE 2

Results Obtained From Feeding High Moisture Barliey To Yearling Steers (Average Of Seven) Comparisons Over Four Year Period*

	High Moisture	Dry	Difference
Total No. of Steers	48	48	
Average daily gain (lb.)	2.67	2.52	.15
Daily barley consumption[1] (lb.)	14.35	13.57	.76
Feed per cwt gain[1] (lb.)	722.0	735.0	13.0

[1] On a dry matter basis.
*Krall, 1969.

There are, however, disadvantages to the use of high moisture barley in feedlots. For example, 20 to 25 per cent more weight must be transported when high moisture barley is used. This increased weight can be quite significant if the silo is quite far from the feedlot.

TABLE 3

Pounds Of High-Moisture Grain Necessary To Supply The Same Amount Of Dry Matter As One Pound Of "Dry" Barley (10 Per Cent Moisture).

% Moisture	Pounds Of High Moisture Barley Necessary To Equal One Pound Of "Dry" Barley
15	1.06
20	1.12
25	1.20
30	1.28
35	1.38
40	1.50
45	1.64

Little work has been done with high moisture barley as a feed for dairy cattle. However, one might predict that if high moisture silage were being fed as the major roughage, problems in dry matter consumption may be encountered. Therefore, if such silage is being used, dry barley may be consumed in greater quantities than high moisture barley.

Some work has been done with high moisture barley as a hog feed. In this experiment, there was no significant difference in average daily gain between hogs fed dry barley and hogs fed high moisture barley. The feed conversion and carcass characteristics were similar for the hogs fed the two rations.

High moisture barley will probably eliminate the dust problem often encountered when very dry barley is processed. This lack of dust and fines in the ground product may be a factor in improving palatability. Certainly in areas where there is a considerable amount of wind, there may be less feed loss in bunks from high moisture barley than from dry barley.

So, does it pay to feed high moisture barley? Certainly this must be considered for each individual operation. The advantages in field operations and the slight advantages in feeding value must be balanced against the storage problems, processing problems and increased costs of transportation. Each operation is different and each manager must assess his own situation.

The above discussion has been about barley which was harvested in a high moisture condition. We have heard, from some companies, a great deal about the advantages of "reconstituting" barley, that is, adding water to dry grain to create a high moisture product. Reconstituted barley is not the same as high moisture barley! In the Montana studies, the researchers encountered difficulties in getting whole kernels sufficientliy wet. They found that by soaking the kernels in water for five minutes they could only increase the moisture content by 13 to 15 per cent. The resulting moisture levels proved inadequate for good fermentation and compaction in a trench silo. Tempering by wetting overnight then wetting again before ensiling, or alternatively, processing the kernel, increased the absorption enough to allow them to increase the moisture content to at least the desired 30 per cent level. However, manufacturers of air-tight silos do not recommend that processed barley be used in their structures since bridging may result. Therefore, this procedure of processing and then wetting would only be applicable to horizontal silos. **There were no differences obtained between reconstituted barley and dry barley in two feeding experiments.** Since adding water would not be expected to increase the feeding value of barley, this practice cannot be recommended because of the high labour cost involved.

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